DOCUMENT RESUME

ED 189 145 TM 800 315

AUTHOR Van Damme, Jan: Masui, Chris
TITLE Locus of Control and Other Student Characteristics in Interaction with the Personalized System of Instruction versus Lectures. Report No. 20.
INSTITUTION Leuven Univ. (Belgium).
PUB DATE Apr 80
NOTE 32p.: Paper presented at the Annual Meeting of the American Educational Research Association (64th, Boston, MA, April 7-11, 1980).

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Achievement: Analysis of Variance: *Aptitude Treatment Interaction: Higher Education: *Individualized Instruction: Intelligence: *Lecture Method: *Locus of Control: Participant Satisfaction: Retention (Psychology): Study Habits
IDENTIFIERS *Personalized System of Instruction

ABSTRACT

This research examined interactions between internal-external locus of control and other student characteristics, and lectures and two variants of the Personalized System of Instruction. The three treatments varied in degree of study guidance. The research was done with 60 college freshmen in an introductory course on psychodiagnostics. The extreme group analysis of variance and regression analyses indicated several aptitude-treatment interaction (ATI) effects. An important ATI effect--the more guidance the better the achievement of the externals compared to the internals--was found for a retention test but not for the tests taken during the studying period. Furthermore, there were lower order interactions between the treatments, various abilities, study habits, and attitudes for several dependent variables: namely, the retention test, the studying time, and the satisfaction with the treatment. The findings show that one of the causes of the inconsistency in research on the interaction between locus of control and academic achievement may depend on the treatment applied. (Author/CTM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

JAN VAN DAMME

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Katholieke
Universiteit
Leuven

Departement
Pedagogische Wetenschappen

AFDELING
DIDACTIEK EN PSYCHOPEDAGOGIEK

APR 1980
RECEIVED
ERIC/TM

Report no. 20

LOCUS OF CONTROL AND OTHER STUDENT CHARACTERISTICS IN INTERACTION WITH THE PERSONALIZED SYSTEM OF INSTRUCTION VERSUS LECTURES

Jan VAN DAMME and Chris MASUI

University of Leuven, Belgium

Paper presented at the Annual Meeting of the
American Educational Research Association
Boston, 7 - 11 April 1980

Katholieke Universiteit Leuven
Departement Pedagogische Wetenschappen
Afdeling Didactiek en Psychopedagogiek
Vesaliusstraat 2
B - 3000 LEUVEN (Belgium)

LOCUS OF CONTROL AND OTHER STUDENT CHARACTERISTICS IN INTERACTION WITH THE PERSONALIZED SYSTEM OF INSTRUCTION VERSUS LECTURES

Jan VAN DAMME and Chris MASUI

University of Leuven, Belgium

Summary

This research examined interactions between internal-external locus of control and other student characteristics on the one hand and lectures and two variants of the Personalized System of Instruction (P.S.I.) on the other hand. The three treatments varied in degree of study guidance. The research was done with 60 freshmen in an introductory course on psychodiagnostics.

The extreme group anova and regression analyses indicated several A.T.I.-effects. An important A.T.I.-effect -- the more guidance the better the achievement of the externals compared to the internals -- was found for a retention test but not for the tests taken during the studying period. Furthermore there were lower order interactions between the treatments and various abilities and study habits and attitudes for several dependent variables, viz. the retention test, the studying time and the satisfaction with the treatment.

Lefcourt (1976) states that the results of the research concerning the relation between locus of control and academic achievement are inconsistent. Our findings show that one of the causes of the inconsistency may be the fact that the relation referred to depends on the treatment applied.

Individuals vary on the perceived locus of control dimension (internal - external). Persons described as internals perceive the events in their lives as a consequence of their own behavior, their ability and effort. Externals, on the other hand, perceive these events as controlled by external factors, such as powerful others, chance, luck and fate.
On the basis of the foregoing features of internals and externals it can be expected that internals show more overt striving for achievement (Rotter, 1966). Consequently, one would expect that internals show greater academic success than externals. However, the results of the research into the relationship between perceived locus of control and academic achievement have been equivocal. This is demonstrated by the differing conclusions on current research formulated by Lefcourt (1976) and Phares (1976).
Lefcourt concluded that "the relationships ... are often riddled with inconsistent and ...'weird' results" (p. 71) and Phares wrote that "the data support the basic hypothesis that internal beliefs are significantly related to academic achievement" (p. 110).

Current research literature amply hypothesizes about the complex relationship between perceived locus of control and academic achievement. One possible explanation of these complex relations is that they depend on the teaching method or treatment, in other words, an explanation in terms of aptitude-treatment interactions (Cronbach and Snow, 1977).

The research project we want to present here relates to such an ATI-hypothesis(1). In order to justify this hypothesis we have to give some information about the instructional environment in which research was carried out, viz. the first year of a Belgian university.
This first year is highly selective,in that more than half of the students fail, at least in the departments of psychology and education. The problem for the students is:'to pass or not to pass'. Although other teaching methods have been used as well, the lecture method has up till now been the prevailing one. Most examinations are organized in a period of only a few weeks at the end of the academic year. Due to the considerable number of students, both teaching and examining are rather anonymous activities. In view of this situation it is not a surprise to hear students ascribing their failure to the influence of powerful others or bad luck.

The expectation that guided our research was that in the educational context just described, externality would largely coincide with unsatisfactory study results. Formulating our hypothesis in an ATI-perspective, we decided to orga-

nize part of the instruction in such a manner, that students would more than usually link study results with their own behavior, ability and effort. Applying the 'compensatory model' of ATI-research (Salomon, 1972), we presumed that such a form of instruction would especially be helpful to externals.

The teaching method we selected and which was expected to have a compensatory effect on externals, was a form of the Personalized System of Instruction or PSI (Keller and Sherman, 1974). This is a teaching method in which the students study the learning material independently. The learning material contains, in addition to the study text, a survey of the contents concerned, the required initial knowledge,the specific objectives and some self-evaluating questions. The students have the possibility to ask for explanation about the subject-matter, and they have the opportunity to take several tests to get some feedback on their studying. Mastery of a unit is required to start with the next one.

As will be elucidated below, we used two variants of PSI, differing in degree of guidance. We assumed that the study results of externals, compared to those of internals, would be more positively influenced by the guidance. Along with our research to test this hypothesis, we explored a number of other ATI-effects.

Instructional context and subjects

Before describing how the variables were operationalized, information needs to be given on the subjects and on the specific instructional context in which the research took place.

The research was done with first year students of the Faculty of Psychology and Educational Sciences (K.U. Leuven). For several reasons, which we do not take into consideration here, we chose the subject 'Introduction to Psychodiagnostic Methods' (taught by Prof. Dr. P.J. Janssen) and more specifically the chapters on reliability (chapter 4) and validity (chapter 5). The teaching and subsequent assimilation of these chapters were to take place within approximately one month.

As we were also concerned with qualitative research into studying behavior and the problem solving strategy (see Van Damme and Masui, 1979), only a limited number of students were involved in the research. In view of extreme group anova we selected 60 students (30 internals and 30 externals) from the group of which data were available (N = 251). In choosing our testees and distributing them over the different treatments we aimed at representativity for the whole group as to sex, age, field of study in secondary school and final results in secondary education. The students selected were asked to cooperate, and those who

did not reply or refused (N = 5) were replaced by others.

Operationalization of the variables

Treatments

The first teaching method - the most common one, also used for the other parts of the course - was the lecture method (LEC).

During the period of research, which lasted for about 4 weeks, 8 lectures of 1.30 h. each were given, offering a systematic exposition of the subject-matter. Students also had a syllabus at their disposal (104 p.). The LEC-group was asked to assimilate two subsequent lectures at a time and were tested before the next lecture. To prepare and to take these tests, they had about four days at their disposal. Their tests were neither immediately corrected nor discussed.

In the two other groups of students the lecture method was replaced by a form of PSI. PSI-students did not attend any lecture but independently studied the syllabus, which was completed with all information given orally during the lectures. In addition to the study text the students had a written survey of the contents concerned,together with information on the required initial knowledge and on the objectives. They had the opportunity to ask for explanation. The students had to get through four units in about one month. After each unit a test had to be taken, and those who failed it were requested to study the unit again and to take another test. After the second test they could go to the next unit, in any case. The tests were immediately corrected and discussed with the students concerned.

So far the common characteristics of the two PSI-variants.As stated before, these variants differed in degree of guidance. In PSI-1, the variant with less guidance, only general objectives were inserted in the learning material. In PSI-2, the variant with more guidance, the learning material included, in addition, a list with specific objectives, study directives, self-evaluating questions and the correct responses to these questions.

It will be clear by now that our project, in contrast to some of the other applications of PSI, offered no alternative options as far as the objectives are concerned. Nor did the students have much autonomy as to the rate of studying, though the PSI-groups had relatively more freedom than the LEC-group.

Aptitudes

To measure the locus of control (LOC) we used the Dutch I-E questionnaire of Andriessen (1972). This is an adaptation (partly translated, partly newly constructed) of the scale of Rotter (1966). The scale consists of 40 items (a.o. 7 fillers) : 26 multiple choice items and 14 items which have to be answered on a graphic scale. Testees can score from 1 to 6 on each item (min. score : 33; max. score : 194), in such a way that externals score high and internals low. The test-retest reliability coefficient of the scale is .88 (N = 24; 3 months' interval).

In view of explorative ATI-research, following features of students were measured : intelligence, previous study results, studying skills and three study habits and attitudes : studying perseverance, studying routine and certainty about the study choice.

To measure the intelligence (INT), we used a Leuven version of the verbal-numerical part of the AH5, a group paper and pencil test constructed by Heim (De Bruyn, 1970).

The previous study results (PSR) are the percentages scored in the last year of secondary education. Since our testees have extremely varying educational backgrounds, these percentages are nearly incommensurate.

Studying skills (SSK) were measured by an instrument developed specifically for the group of students concerned (Nicolaers, 1977; Janssen, 1978).

The test consists of silently reading 8 texts that are representative of the fields of study in education and of answering 56 questions about them.

Finally, the 3 study habits and attitudes were measured with a studying behavior questionnaire, within which 3 scales were distinguished on the basis of a factor analysis (Van Rosendaal, 1977; Janssen, 1978). The scale of studying perseverance (SPER, 27 items) shows to what extent and how systematically one studies. By means of the scale of studying routine (SROU, 23 items), the degree of self-confidence in one's own studying behavior is indicated. The scale called certainty about study choice (CSCH, 25 items) states whether and to what extent the testee is convinced of having chosen the right academic field of study.

Dependent variables

We will describe the achievement measures first, and then mention the remaining dependent variables : studying time and satisfaction with the treatment.

Several achievement measures were administered. For each unit each of the students was tested once or twice. Here we restrict ourselves to data about the

first test on each unit : to arrive at T4 we added up the results of the first tests on the 2 units of Chapter 4, to arrive at T5 the same procedure was followed for Chapter 5.

The answers on the seperate questions were judged qualitatively and classified in three to six categories which were added up to T4 or T5 (see Marton and Säljö, 1976). T is the sum of T4 and T5. In addition to those tests, two retention tests had to be taken. The students knew about the second one (EXAM), which took place some three months after the instruction period, but not about the first one (RETE), organized only two weeks after this period.

In order to obtain the necessary data on studying time (ST), students were asked to note down the time at the beginning and the end of each period of work.

The dependent variables we used, were the amount of time spent studying up to T4 (ST4), up to T5 (ST5) and the sum of both (ST). All time variables are expressed in minutes. As to the LEC-group, lecture time was considered to be studying time, too.

Finally a number of evaluating questions were asked to obtain a measure for satisfaction with the treatment (SATF) among the students.

Results

In view of the limited number of testees, we never analyzed more than one aptitude and one dependent variable at a time. What we did calculate were the intercorrelations, for the total group, between the aptitudes (table 1) and between the dependent variables (table 2).

Table 1 shows that locus of control does not correlate with the abilities, but does so with the study habits and attitudes : internals score higher than externals on studying perseverance, studying routine and certainty about study choice. Studying skills correlate with intelligence and previous study results, but the latter two variables do not intercorrelate. As for the study habits and attitudes, perseverence is related to previous study results and routine to intelligence; both perseverance and routine correlate with certainty about study choice.

Table 2 shows that the time spent on the preparation of a test, is only to a small degree related to the scores on that test. The satisfaction with the treatment and, to a smaller extent, the unannounced retention test negatively correlate with the studying time. This retention test correlates far less with the tests taken during the studying period than the announced retention test. Finally, the degree of satisfaction is related to a lesser extent to the tests taken during the studying periode than to the retention test.

As for the ATI-effects we will start with locus of control (extreme group anova) and then pass on to the remaining aptitudes (regression analysis), restricting ourselves to essentials. More detailed information is available in the tables and figures.

Locus of control

The means and standard deviations for locus of control and the dependent variables, and the numbers of students are shown in table 3.
With regard to the number of testees - max. 10 internals and 10 externals in each treatment group - a different number of data is available for each of the dependent variables. It is striking that mainly among the PSI-2-group students dropped out prematurely, but, as far as could be traced, this was due to coincidence.

By means of a number of analyses of variance (with the 3 treatments together and with each combination of 2 treatments) we tested the main effect of the treatments (LEC, PSI-1, PSI-2), the main effect of locus of control (LOC) and the interaction effect of those two variables on each of the dependent variables (T4, T5, T, ST4, ST5, ST, SATF, RETE, EXAM). The results are shown in table 4 and figure 1.
Our hypothesis was that externals would achieve relatively better than internals as guidance would increase (PSI-2 > PSI-1 > LEC). It is partially confirmed on the retention tests but not on the tests taken during the studying period. Unlike the internals externals score higher on RETE in both PSI-conditions than in the LEC-condition (and on this dependent variable, the differences between the two PSI-conditions show the same tendency too). With EXAM as a dependent variable, the above applies only when comparing PSI-1 and LEC. This trend also manifests itself on T4, whereas on T5 hardly any differences show.
Broadly speaking, the results indicate that as for achievement measures internals score distinctly higher than externals in the LEC-condition, but do not do so in a PSI-setting (fig.1a-e). On the other hand, when both PSI-conditions are contrasted with each other ATI-effects are minimal.
No significant ATI-effects were found on the remaining dependent variables.
Besides the ATI-effects the following main effects are worth mentioning. The PSI-2-group (and to a lesser extent also the PSI-1-group) scores higher than the LEC-group on the first test. In connection with studying time we have to conclude that students, notably externals, worked longer in PSI-1 (and to a lesser extent also in PSI-2) than in the LEC-condition. Looking at the variable satisfaction with the treatment we could not detect any significant effects. In any case, the PSI-students are not more satisfied than the stu-

dents who attended lectures - rather on the contrary. The fact that the PSI-conditions required a lot of studying time, is very likely responsible for this. Another reason may be that also the LEC-condition included some tests.

Other aptitudes

The numbers of students are shown in table 5, the means and standard deviations in table 6, the correlations between aptitudes and dependent variables in table 7, and the other results of the regression analyses in table 8 and in figure 2.

Below we will sum up the most important results of the explorative ATI-research and subsequently give a possible interpretation thereof.

First this : table 6 shows that the treatment (sub)groups are not completely equivalent. The PSI-1-group scores low with regard to studying skills, whereas the PSI-2-group scores high with regard to this variable and intelligence. Even more important is the fact that within the LEC-group, the externals prove to be less intelligent than the internals, whereas the opposite applies within the PSI-1-group (and to a lesser extent also within the PSI-2 group). As far as study habits and attitudes are concerned, it is striking that the PSI-1-group shows a high score for studying perseverance and the PSI-2-group for studying routine.

Table 8 shows that, apart from one exception, no significant ATI-effects emanate on the tests taken during the studying period (T4, T5 and T) and on the retention test which was announced beforehand (EXAM). On the unannounced retention test, on the contrary, a lot of ATI-effects were to be found. This also goes for the studying time (ST4, ST5 and ST) and the degree of satisfaction (SATF). We will now mention the most important results classified according to the aptitudes : first the abilities (INT, PSR and SSK), then the study habits and attitudes (SPER, SROU and CSCH).

If the relation between intelligence and studying time is negative in all treatments, this is especially the case in the PSI-2-condition (fig. 2b). In this treatment especially the least intelligent students have spent a lot of time studying. As a consequence of the concrete study guidance the less intelligent students devote more time to studying, which initially leads to better results (at least on T5, fig. 2a); their retention scores, however, are not higher.

The regression of RETE on intelligence is positive in the LEC- and PSI-2-condition, but negative in the PSI-1-condition (fig. 2c). In the latter treatment, in which the students have to learn independently and without much help, the intelligent students do not prove to be doing better than the less intelligent ones as far as retention is concerned.

From the analyses involving the previous study results as aptitudes, we found that the students, having lower marks, obtain high scores on the retention test only in the PSI-2-condition, i.e. the treatment with most guidance (fig. 2e). Also they are most of all satisfied with this treatment, whereas in the PSI-1-condition students with good marks are more satisfied than students with lower marks (fig. 2d).
It is noteworthy that studying skills go along with high RETE-scores in the PSI-2-condition (the condition with study directives) - as well as in the LEC-condition - but not in the PSI-1-condition (the condition without study directives)(fig. 2f).

The three components of the study habits and attitudes significantly interact with the treatments with respect to the studying time, the satisfaction and the retention (RETE).
Especially in the PSI-1-condition, the studying time turns out to be dependent on the studying perseverance (fig. 2g). This means : if mastery is required and if no specific objectives and self-evaluating questions are given, the studying perseverance is largely responsible for the time spent on studying.
It becomes clear that in the LEC-group satisfaction with the treatment and retention are positively related to studying perseverance, whereas this is not the case in the PSI-1-group. Furthermore, in the PSI-2-group satisfaction and retention are negatively related to studying perseverance. Consequently,the maximum of guidance in PSI-2 leads to higher achievement and more satisfaction for students with little perseverance. Lectures, on the other hand, lead to higher achievement and more satisfaction, especially for students with a lot of studying perseverance.
As for the studying routine, i.e. confidence in one's own studying activities, it is noteworthy first of all that this student characteristic always negatively correlates with the studying time, but this especially applies in PSI-2 (fig. 2j). The communication of specific objectives, study directives and self-evaluating questions stimulates students with little self-confidence to spend a lot of time studying. In both PSI-conditions, students with a lot of self-confidence are more satisfied than students with little self-confidence, but not so, however, in the LEC-condition (fig. 2k). Apparently, students with little confidence are only satisfied when the teacher has explained the subject-matter.
On the retention test, students with a lot of self-confidence score higher in the LEC-condition, whereas students with little self-confidence obtain the high-

est scores in the PSI-1 condition (fig. 21). From the latter 2 ATI-effects we can see that confidence in one's own studying behavior somewhat inversely interacts with the treatments on satisfaction and on retention.
Finally, with regard to the certainty about study choice, it becomes clear that the students who are sure to have chosen the right discipline are responsible for the surplus of studying time in the PSI-conditions (fig. 2m). Those students are, however, broadly speaking, most of all satisfied with the regular teaching method - lectures - whereas the ones who are not sure of their choice, are most satisfied with the PSI with the maximum of guidance (fig. 2n). On the retention test the ones who are sure of their choice obtain better marks than the other ones in the LEC-group, whereas this applies to a lesser extent or not at all in the PSI-conditions (fig. 2o).
Generally speaking, the students who feel best at ease with the chosen discipline spend more time in PSI (the irregular instructional method); they are relatively unsatisfied with this treatment and obtain a lower retention score (this always in comparison with the lecture group).

Apart from the ATI-effects summed up above, the following results are remarkable (see table 7). The scores on the tests, taken during the studying period, seem to correlate more with the previous study results than with intelligence, whereas the opposite holds true for the retention tests. The studying skills correlate more with the first test (T4) than with the second one (T5), and more with the announced retention test than with the unannounced one. The study habits and attitudes neither correlate with the tests taken during the studying period (with the exception of the correlation between studying perseverance and the tests in the LEC-group) nor do they correlate, with one exception, with the announced retention test.

Discussion

The research hypothesis was that perceived locus of control and the treatments interact in such a way that the externals (in comparison with the internals) get better achievements as guidance increases (PSI-2 > PSI-1 > LEC). This hypothesis is confirmed to the extent that in the LEC-condition the internals constantly get better achievements than the externals, whereas - except on T5 - this applies to a lesser degree or not at all in the PSI-conditions. The ATI-effect, is, however, only significant on the retention tests, viz. on the unannounced retention test for LEC vs. PSI-1 and for LEC vs. PSI-2, and on the announced retention test for LEC vs. PSI-1. With some reservations, we may say that providing study guidance is useful to the externals. This conclusion shows that ATI-effects can cause inconsistency in the results of the research into the relationship between locus of control and academic achievement.

In order to prevent that our findings are unjustly considered as being in contradiction with other results of research in this field, we would like to stress the following. A study of the research literature shows that sometimes in a PSI-setting it is found that, as is the case in our study, externals perform as well as internals (Johnson and Croft, 1975; Keller et al., 1978) and that sometimes it is found that internals perform better than externals (Allen et al., 1974 and, in a PSI-like setting, Daniels and Stevens, 1976). In all these studies, an essential characteristic of the applied PSI is that students to a large degree control the instruction, and they themselves can even determine the grades they work for (contract for grade plan).
From the description of our treatments it should be clear that the following was essential in our PSI : the orientation to a larger extent of the studying of the students (by the communication of objectives, by the requirements of mastery, by the opportunity to ask explanatory questions and, for PSI-2, by the communication of more specific objectives, study directives and self-evaluating questions). The student control over the course requirements was not any greater in the PSI-groups than in the LEC-group.

However, the main conclusion of our study can be completed and interpreted in a way different from the interpretation given before.
Firstly, our findings about studying time show that - although it must be said that the ATI-effect is not significant - mainly the externals spent more time in the PSI-condition than in the LEC-condition.
Secondly, it is possible to give an alternative explanation to our findings. As we said already, we came to the conclusion that the groups compared are not completely equivalent as to their intelligence. Within the LEC-group, the internals are on the average more intelligent than the externals, and the contrary goes for the PSI-2-group and especially for the PSI-1-group. As far as the studying skills are concerned, the same tendencies show. These differences in intelligence and studying skills could also be an explanation for our findings. (The fact that the LEC-internals do better on the retention tests than the PSI-internals supports this interpretation.)

So far some comments on the ATI's with locus of control. The explorative research with the other aptitudes has yielded a lot of ATI-effects, in spite of the very limited number of students.
As far as the dependent variables are concerned, it is striking that no ATI-effects are found on the tests directly prepared by the students, but they become apparent indeed on the unannounced retention test and on variables such

as studying time and satisfaction. Nachman and Opochinsky (1958) already pointed out that, in educational research, an individually prepared test was a disputable criterion measure.

As for the aptitudes, ATI-effects were found with all measured student characteristics, but remarkably many were found with the study habits and attitudes - a relatively little studied kind of ATI-effects. Most of these ATI-effects contribute to the construct validation of the questionnaires used to measure those study habits and attitudes.

Although we did not focus upon this in our research, we found that locus of control correlates with self-report measures of study attitudes (studying routing and certainty about study choice) and, to a lesser extent, with study habits (studying perseverance). The same findings were laid down by other researchers (Prociuk and Breen, 1974; Ramanaiah et al., 1975; Keller et al., 1978).

Our research confirms that in education treatments and student characteristics interact with regard to highly varying dependent variables, maybe even with such a diversity that generalization of results is problematic (Cronbach, 1975; Snow, 1977).

Note

(1) The research was supported by the 'Onderzoeksfonds' of the Katholieke Universiteit Leuven, formerly called the 'Fonds Derde Cyclus'. The other researchers involved in the project were : E. De Corte, N. Huygelier, P.J. Janssen, R. Vandenberghe and, till November 1977, H. De Neve. More extensive information about the research is available in the following internal dutch reports :

- C. MASUI, Voorlopig deelrapport van een exploratief onderzoek over prestaties, oplossingsstrategieën, studeergedrag, treatments en aptitudes. Leuven, Afdeling Didactiek en Psychopedagogiek, Katholieke Universiteit Leuven, 1978, 160 pp. + app.
- C. MASUI, Exploratief onderzoek over prestaties, oplossingsgedrag, studeergedrag, treatments en aptitudes. Leuven, Afdeling Didactiek en Psychopedagogiek, Katholieke Universiteit Leuven, 1979, 99 pp.+ app.

References

ALLEN, G.J., GIAT, L. & CHERNEY, R.J., Locus of control, test anxiety, and student performance in a personalized instruction course. Journal of Educational Psychology, 1974(66), 968-973.

ANDRIESSEN, J.H.T.H., Interne of externe beheersing. Nederlands Tijdschrift voor Psychologie, 1972(27), 173-198.

CRONBACH, L.J., Beyond the two disciplines of scientific psychology. American Psychologist, 1975(30), 116-127.

CRONBACH, L.J. & SNOW, R.E., Aptitudes and instructional methods. A handbook for research on interactions. New York, Irvington, 1977, XVIII-574 pp.

DE BRUYN, E., The measurement of intelligence among higher levels. II. Revision of the AH5. Psychologica Belgica, 1970(10), 169-179.

JANSSEN, P.J., Tussen studiekeuze en studieresultaat. Psychologisch onderzoek van componenten in het studeergedrag van eerstejaars in onze faculteit. Leuvens Bulletin LAPP, 1978(27), 15-27; 52-67.

JOHNSON, W.G. & CROFT, R.G.F., Locus of control and participation in a Personalized System of Instruction course. Journal of Educational Psychology, 1975(67), 416-421.

KELLER, J.M., GOLDMAN, J.A. & SUTTERER, J.R., Locus of control in relation to academic attitudes and performance in a Personalized System of Instruction course. Journal of Educational Psychology, 1978(70), 414-421.

KELLER, F.S. & SHERMAN, J.G. (Eds.), The Keller Plan handbook. Essays on a Personalized System of Instruction. Menlo Park, Calif., Benjamin, 1974, XII-99 pp.

LEFCOURT, H.M., Locus of control. Current trends in theory and research. Hillsdale, N.J., Lawrence Erlbaum, 1976, XI-211 pp.

MARTON, F. & SÄLJÖ, R., On qualitative differences in learning. I. Outcome and process. British Journal of Educational Psychology, 1976(46), 4-11.

NACHMAN, M. & OPOCHINSKY, S., The effects of different teaching methods : a methodological study. Journal of Educational Psychology, 1958(49), 245-249.

NICOLAERS, J., Ontwerp van een studeervaardigheidstest voor de Pedagogische Wetenschappen. Leuven, Centrum voor Psychodiagnostiek en Studie- en Beroepsoriëntering, Katholieke Universiteit Leuven, 1977, V-93 pp + app.

PHARES, E.J., Locus of control in personality. Morristown, N.J. General Learning Press, 1976, 217 pp.

PROCIUK, T.J. & BREEN, L.J., Locus of control, study habits and attitudes, and college academic performance. Journal of Psychology, 1974(88), 91-95.

RAMANAIAH, N.V., RIBICH, F.D. & SCHMECK, R.R., Internal external control of reinforcement as a determinant of study habits and academic attitudes. Journal of Research in Personality, 1975(9), 375-384.

ROTTER, J.B., Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 1966(80),no. 1 (whole no. 609), 28 pp.

SALOMON, G., Heuristic models for the generation of Aptitude-Treatment Interaction hypotheses. Review of Educational Research, 1972(42), 327-343.

SNOW, R.E., Individual differences and instructional theory. Educational Researcher, 1977(6), no. 10, 11-15.

VAN DAMME, J. & MASUI, C., Analysis of study behavior and problem solving strategies as a starting-point for individualization in higher education. Leuven, Afdeling Didactiek en Psychopedagogiek, Katholieke Universiteit Leuven, 1979, 14 pp.

VAN ROSENDAAL, A., Keuzerijpheid en studeergedrag. Een exploratief onderzoek bij eerstejaars naar het verband tussen de omvang van vooraf opgedane informatie en de mate van studiekeuzezekerheid. Leuven, Centrum voor Psychodiagnostiek en Studie- en Beroepsoriëntering, Katholieke Universiteit Leuven, 1977, 96 pp. + app.

Table 1

Intercorrelations of the Aptitudes

	LOC (1)	INT	PSR	SSK	SPER	SROU
INT	-.02					
PSR	.02	.04				
SSK	.04	.29***	.30***			
SPER	-.28***	.03	.30***	-.11		
SROU	-.41***	.42***	-.12	.06	.05	
CSCH	-.44***	.24	-.05	.06	.43***	.39***

43 ≤ N ≤ 60 *p< .10 **p<.05 ***p<.01

(1) For LOC (extreme groups) point-biserial coefficients are given. The significant correlations in the total group (N = 198) are : -.18 with SPER, -.27 with SROU and -.29 with CSCH (communicated by P.J. Janssen).

Table 2

Intercorrelations of the Dependent Variables

	T4	T5	T	ST4	ST5	ST	SATF	RETE
T5	.49***							
T	.90***	.83***						
ST4	.04	.05	.06					
ST5	.03	.21*	.13	.70***				
ST	.07	.16	.14	.90***	.94***			
SATF	.15	.18	.23*	-.29***	-.35***	-.36***		
RETE	.29***	.11	.23*	-.25***	-.19	-.20	.26***	
EXAM	.57***	.42***	.60***					.23***

39 ≤ N ≤ 54 *p<.10 **p<.05 ***p<.01

Table 3

Means and Standard Deviations for Locus of Control and the Dependent Variables

		LOC	T4	T5	T	ST4	ST5	ST	SATF	RETE	EXAM
LEC	M	107.65	29.66	34.79	66.30	899	1032	1839	2.84	5.12	10.72
	SD	23.28	8.34	4.82	11.01	242	198	348	.90	2.19	2.85
	N	20	20	17	17	20	17	17	19	17	18
LEC-I	M	86.10	30.97	35.67	67.20	828	1055	1826	2.90	6.20	11.33
	SD	6.26	8.20	5.89	12.87	253	260	404	.99	2.18	3.43
	N	10	10	9	9	10	9	9	10	10	9
LEC-E	M	129.20	28.36	33.79	65.28	849	1007	1853	2.78	3.57	10.11
	SD	8.56	8.70	3.34	9.24	244	105	300	.83	.90	2.15
	N	10	10	8	8	10	8	8	9	7	9
PSI-1	M	107.15	32.53	36.35	68.77	1032	1368	2395	2.22	4.94	10.00
	SD	23.73	6.13	6.36	11.39	400	487	865	1.22	1.30	2.41
	N	20	20	17	17	18	15	15	18	17	20
PSI-1-I	M	85.30	31.25	37.97	69.29	908	1239	2117	2.50	5.14	9.10
	SD	6.41	5.48	3.80	7.82	310	514	787	1.07	.99	2.28
	N	10	10	9	9	9	7	7	8	7	10
PSI-1-E	M	129.00	33.81	34.53	68.19	1155	1480	2639	2.00	4.80	10.90
	SD	9.30	6.77	8.30	15.02	458	466	905	1.33	1.47	2.28
	N	10	10	8	8	9	8	8	10	10	10
PSI-2	M	108.10	35.50	35.97	71.31	893	1244	2238	2.53	5.66	10.38
	SD	24.00	8.69	7.18	13.43	312	512	781	1.46	1.49	3.32
	N	20	16	15	15	15	12	11	15	12	16
PSI-2-I	M	86.10	34.87	36.78	71.21	875	1190	2143	2.29	5.20	10.38
	SD	5.80	8.19	8.37	15.58	192	99	262	1.38	1.17	3.81
	N	10	8	7	7	8	5	5	7	5	8
PSI-2-E	M	130.10	36.13	35.29	71.39	914	1283	2317	2.75	6.00	10.38
	SD	10.32	9.69	6.47	12.36	429	685	1071	1.58	1.60	3.02
	N	10	8	8	8	7	7	6	8	7	8

Table 4

Analyses of Variance (F-values) - Aptitude : Locus of Control

Dep. Var.	Source	Treatment Groups LEC/PSI-1/PSI-2	LEC/PSI-1	LEC/PSI-2	PSI-1/PSI-2
T4	Treatment(T)	2.451*	1.501	4.011*	1.387
	LOC (L)	.026	.000	.094	.623
	T x L	.576	1.217	.439	.066
T5	Treatment(T)	.310	.657	.348	.008
	LOC (L)	1.674	1.882	.605	1.094
	T x L	.111	.164	.007	.158
T	Treatment(T)	.675	.391	1.285	.320
	LOC (L)	.079	.145	.044	.012
	T x L	.029	.011	.055	.020
ST4	Treatment(T)	1.744	3.373*	.331	1.107
	LOC (L)	1.340	1.496	.088	1.462
	T x L	.686	1.163	.008	.682
ST5	Treatment(T)	2.560*	6.518**	2.239	.449
	LOC (L)	.491	.451	.004	.793
	T x L	.481	1.250	.250	.138
ST	Treatment(T)	2.615*	5.694**	3.088*	.238
	LOC (L)	1.278	1.310	.150	1.291
	T x L	.532	1.194	.109	.271
SATF	Treatment(T)	1.180	2.788	.580	.430
	LOC (L)	.060	.733	.109	.016
	T x L	.648	.281	.497	1.034
RETE	Treatment(T)	.839	.022	1.250	1.741
	LOC (L)	3.300*	6.669**	3.280*	.057
	T x L	4.130**	3.946*	6.423**	1.047
EXAM	Treatment(T)	.305	.748	.103	.154
	LOC (L)	.112	.195	.360	1.110
	T x L	1.353	3.273*	.320	.888

* $p < .10$ ** $p < .05$

Table 5

Number of Students for Each Variable and for Each Combination of Variables

		Aptitudes											
		INT			PSR			SSK			SPER SROU CSCH		
		46			60			56			55		
		LEC	PSI-1	PSI-2	LEC	PSI-1	PSI-2	LEC	PSI-1	PSI-2	LEC	PSI-1	PSI-2
		16	17	13	20	20	20	19	20	17	20	18	17
Dep. Var.													
T4	56	16	17	12	20	20	16	19	20	14	20	18	16
T5	49	15	15	12	17	17	15	16	17	14	17	16	15
T	49	15	15	12	17	17	15	16	17	14	17	16	15
ST4	53	16	16	12	20	18	15	19	18	13	20	16	15
ST5	44	15	14	9	17	15	12	16	15	11	17	14	12
ST	43	15	14	9	17	15	11	16	15	10	17	14	11
SATF	52	16	17	12	19	18	15	18	18	14	19	16	15
RETE	46	16	17	12	17	17	12	16	17	11	17	15	12
EXAM	54	14	17	12	18	20	16	17	20	14	18	18	15

Table 6

Means and Standard Deviations for the Aptitudes

		INT	PSR	SSK	SPER	SROU	CSCH
LEC	M	26.81	70.40	17.63	84.55	67.15	89.65
	SD	4.82	5.81	6.47	16.31	13.69	17.09
LEC-I	M	29.00	70.40	18.90	88.00	75.40	100.60
	SD	4.12	6.19	5.45	13.36	10.53	14.07
LEC-E	M	24.00	70.40	16.22	81.10	58.90	78.70
	SD	4.36	5.74	7.19	18.88	11.55	12.32
PSI-1	M	27.35	70.15	15.60	90.28	71.78	93.83
	SD	5.18	5.87	6.42	14.99	9.00	15.80
PSI-1-I	M	25.57	70.30	14.70	92.89	75.22	95.00
	SD	3.95	6.15	5.73	13.91	6.08	16.91
PSI-1-E	M	28.60	70.00	15.66	87.67	68.33	92.67
	SD	5.76	5.91	6.82	16.39	10.42	15.54
PSI-2	M	29.77	69.65	20.06	78.23	77.41	92.29
	SD	3.81	7.21	7.67	17.55	11.28	16.25
PSI-2-I	M	29.17	69.20	18.67	86.50	80.38	101.38
	SD	3.06	7.27	9.52	13.61	11.28	15.22
PSI-2-E	M	30.29	70.10	21.63	70.89	74.78	84.22
	SD	4.54	7.50	4.30	18.02	11.42	13.02

Table 7

Correlations of the Aptitudes and the Dependent Variables

		T4	T5	T	ST4	ST5	ST	SATF	RETE	EXAM
INT	LEC	.56***	.40*	.54***	-.13	-.40*	-.26	.29	.77*****	.62*****
	PSI-1	.32	.13	.24	-.06	-.19	-.13	.26	-.24	.56*****
	PSI-2	.43*	-.33	.17	-.62***	-.67***	-.69***	.45*	.76*****	.48*
PSR	LEC	.52***	.73*****	.61*****	-.23	.13	-.05	.04	.29	.59*****
	PSI-1	.36*	.24	.35*	-.16	-.09	-.14	.26	.10	.33*
	PSI-2	.42*	.50***	.61*****	.18	.35	.29	-.32	-.46*	.32
SSK	LEC	.54*****	.24	.34	-.26	-.20	-.18	.02	.33	.50***
	PSI-1	.44***	.21	.40*	-.19	-.03	-.13	.30	-.14	.51***
	PSI-2	.53***	.39*	.57***	.04	-.10	-.00	.11	.47*	.51***
SPER	LEC	.37*	.53***	.45***	.28	.22	.46***	.46***	.42***	.03
	PSI-1	.10	.04	.10	.66***	.73*****	.76*****	.05	.09	.04
	PSI-2	.07	.06	.10	.37*	.05	.06	-.31	-.51***	.09
SROU	LEC	.06	-.03	.04	-.32*	-.18	-.34*	.02	.53***	.08
	PSI-1	-.04	.21	.10	-.01	-.12	-.08	.24	-.41*	-.05
	PSI-2	.31	.13	.29	-.34	-.58***	-.70*****	.57***	.07	.02
CSCH	LEC	.10	.05	.07	-.32*	-.07	-.20	.42***	.63*****	-.01
	PSI-1	-.15	.01	-.08	.32	.44*	.40*	.05	-.09	.42***
	PSI-2	-.03	-.16	-.09	.13	.24	.25	-.33	.17	-.04

* $p < .10$ *** $p < .05$ ***** $p < .01$

Table 8

Regression Analyses - Various Aptitudes and Dependent Variables (Part I)

Dep.Var.	Apt.		Regression Coefficients Treatment LEC	PSI-1	PSI-2	F-value for the Interaction (F > 1) Treatment Groups LEC/PSI-1	LEC/PSI-2	PSI-1/PSI-2
T4	INT	a	8.0214	23.1716	14.9160			
		b	.8782	.3621	.7540	1.393		
	PSR	a	-22.3959	5.9521	1.9995			
		b	.7395	.3788	.4777			
	SSK	a	17.4440	26.1173	14.9758			
		b	.6594	.4109	.9092			
	SPER	a	13.7059	28.5419	32.3049			
		b	.1887	.0411	.0397			
	SROU	a	27.1190	34.3601	16.7465			
		b	.0379	-.0293	.2402			1.019
	CSCH	a	25.5120	38.1102	37.4338			
		b	.0463	-.0624	-.0205			
T5	INT	a	23.8504	31.8481	50.7736			
		b	.4122	.1465	-.4344		3.372::::	1.169
	PSR	a	-10.8471	19.6348	.1497			
		b	.6390	.2376	.5046	1.710		
	SSK	a	30.7422	33.4266	23.5884			
		b	.1986	.1966	.5550			
	SPER	a	21.6779	34.4635	33.6112			
		b	.1526	.0211	.0289			
	SROU	a	35.4850	24.9996	29.7697			
		b	-.0104	.1597	.0789			
	CSCH	a	33.6337	35.9945	43.8314			
		b	.0127	.0040	-.0821			
T	INT	a	32.8623	55.4127	65.6896			
		b	1.2618	.4900	.3196		1.204	
	PSR	a	-21.3780	24.9353	-10.7092			
		b	1.2277	.6231	1.1552	1.004		
	SSK	a	53.7748	58.6091	38.5642			
		b	.6099	.6828	1.4642		1.277	1.168
	SPER	a	41.2228	60.7002	64.1557			
		b	.2920	.0890	.0876			
	SROU	a	64.5308	60.0611	44.6426			
		b	.0263	.1219	.3393			
	CSCH	a	62.4572	74.1961	79.5084			
		b	.0422	-.0583	-.0856			

:::: $p < .05$

Table 8

Regression Analyses - Various Aptitudes and Dependent Variables (Part II)

			Regression Coefficients			F-value for the Interaction (F > 1)		
			Treatment			Treatment Groups		
			LEC	PSI-1	PSI-2	LEC/PSI-1	LEC/PSI-2	PSI-1/PSI-2
Dep.Var.	Apt.							
ST4	INT	a	953.3564	1175.2743	2525.1062		4.180:::	2.142
		b	-6.0669	-4.3289	-54.3070			
	PSR	a	1511.9263	1763.1795	366.8872		1.322	
		b	-9.5643	-10.4097	7.4338			
	SSK	a	1020.3302	1208.6663	814.5000			
		b	-9.7142	-11.8918	2.0830			
	SPER	a	483.7074	-699.1320	304.6626	5.510::::		2.426::
		b	4.1974	19.4534	7.2779			
	SROU	a	1215.0308	1106.1993	1704.3661			
		b	-5.6058	-.6806	-10.2248			
	CSCH	a	1247.4126	302.2435	625.1930	3.678:::	1.380	
		b	-4.5601	8.0749	2.8152			
ST5	INT	a	1410.3637	1868.3630	4322.0433		7.084::::	2.870::
		b	-14.7147	-16.9484	-103.5734			
	PSR	a	688.0848	1843.4492	-486.7632			1.128
		b	4.8094	-6.6949	24.2088			
	SSK	a	1160.4467	1397.2676	1478.5812			
		b	-6.9418	-1.8975	-11.6572			
	SPER	a	807.1333	-1010.5617	1088.0522	11.530::::		3.258:::
		b	2.6128	26.6558	1.8530			
	SROU	a	1193.6405	1844.0965	3231.1535		5.538::	1.130
		b	-2.4174	-6.0566	-25.5835			
	CSCH	a	1105.1793	225.2788	463.9432	3.352:::	1.023	
		b	-.8099	12.6184	8.1985			
ST	INT	a	2202.9608	3026.9270	6807.1356		7.818::::	2.368
		b	-16.1294	-21.0569	-153.1864			
	PSR	a	2075.4850	3732.5538	-149.6024			
		b	-3.3124	-18.8174	32.9056			
	SSK	a	2049.0092	2643.4818	2191.9786			
		b	-10.6259	-15.9112	-.5536			
	SPER	a	1031.1215	-2024.8296	1961.8360	11.827::::		4.503:::
		b	9.4061	49.5142	3.2367			
	SROU	a	2370.8477	2995.2492	6373.6332		8.119::::	1.944
		b	-7.9319	-7.2786	-52.1156			
	CSCH	a	2195.6574	540.7358	1018.1409	3.502:::	1.374	
		b	-3.9225	20.5718	12.6423			

:: $p < .10$ ::: $p < .05$ :::: $p < .01$

Table 8

Regression Analyses - Various Aptitudes and Dependent Variables (Part III)

			Regression Coefficients			F-value for the Interaction (F > 1)		
			Treatment			Treatment Groups		
			LEC	PSI-1	PSI-2	LEC/PSI-1	LEC/PSI-2	PSI-1/PSI-2
Dep.Var.	Apt.							
SATF	INT	a	1.5957	.6248	-2.8262		1.584	
		b	.0477	.0610	.1795			
	PSR	a	2.4646	-1.4491	7.1858		1.223	2.620*
		b	.0054	.0521	-.0655			
	SSK	a	2.7885	1.3296	1.7617			
		b	.0025	.0550	.0307			
	SPER	a	.6436	1.8474	4.9323		4.551****	1.020
		b	.0257	.0037	-.0294			
	SROU	a	2.7483	.0888	-3.1634		5.343****	1.007
		b	.0014	.0292	.0725			
	CSCH	a	.9286	1.7812	5.8761		4.403***	1.127
		b	.0214	.0042	-.0349			
RETE	INT	a	-4.5035	6.6367	-3.2104	17.388****		10.438****
		b	.3638	-.0620	.2992			
	PSR	a	-3.1477	3.4895	14.7701		3.176***	2.408*
		b	.1160	.0206	-.1264			
	SSK	a	2.9310	5.3783	2.3774	2.087		2.998*
		b	.1196	-.0273	.1506			
	SPER	a	.1123	4.1979	9.8430	1.274	5.616****	2.375*
		b	.0597	.0089	-.0517			
	SROU	a	-.5789	9.2648	4.9238	6.533****	1.473	1.416
		b	.0836	-.0592	.0094			
	CSCH	a	-2.1267	5.9034	3.7508	4.619****	1.673	
		b	.0797	-.0094	.0202			
EXAM	INT	a	.1805	4.7328	1.3784			
		b	.3992	.2098	.3243			
	PSR	a	-9.1867	.5688	.1420	1.238		
		b	.2815	.1344	.1453			
	SSK	a	6.6626	7.0684	3.1490			
		b	.2192	.1879	.3074			
	SPER	a	10.2926	9.3855	9.2705			
		b	.0049	.0068	.0181			
	SROU	a	9.6391	10.9382	10.3539			
		b	.0160	-.0131	.0048			
	CSCH	a	10.9171	3.7658	11.4881	1.371		1.240
		b	-.0021	.0664	-.0079			

* $p < .10$ ** $p < .05$ **** $p < .01$

Figure 1 : Means of Internals and Externals for the Dependent Variables (Part I)

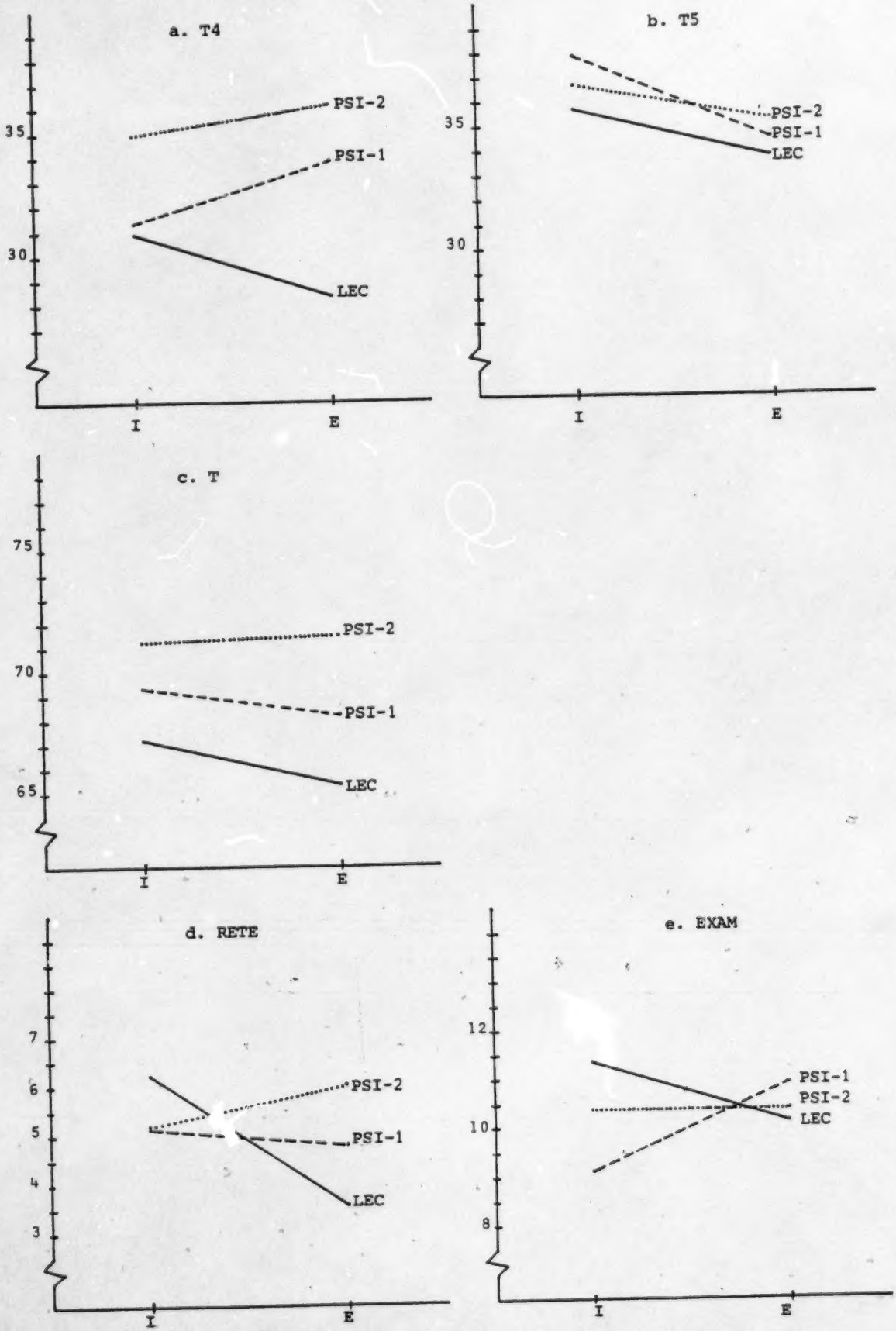
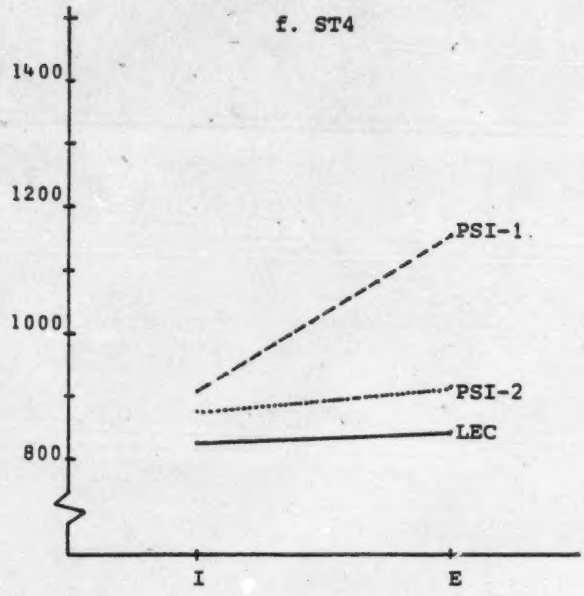
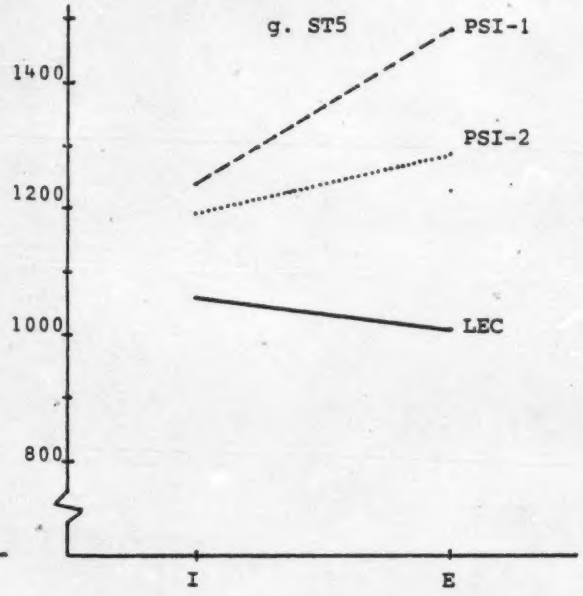
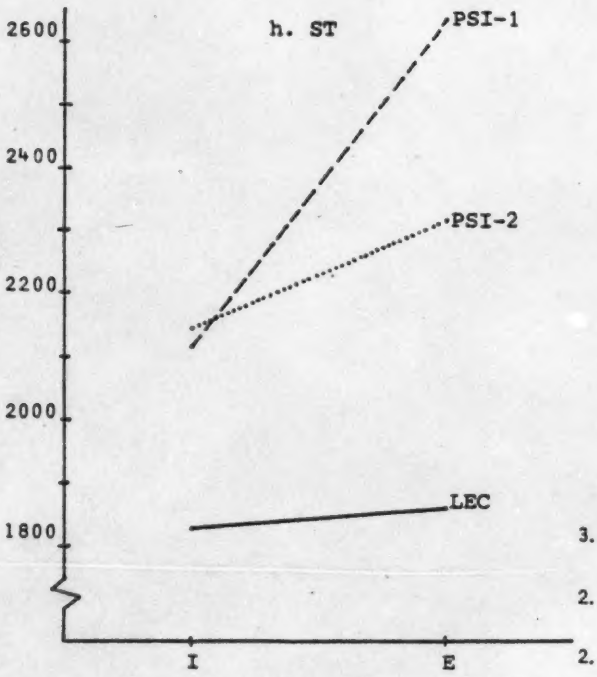


Figure 1 : Means of Internals and Externals for the Dependent Variables (Part II)







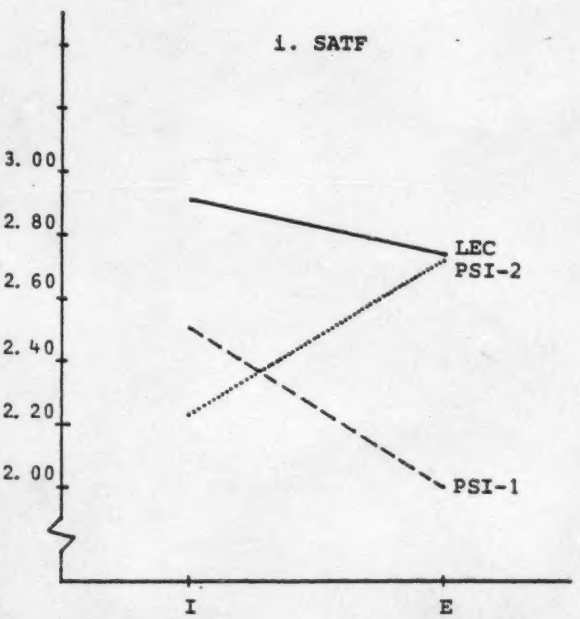


Figure 2 : Regression of Various Aptitudes on Various Dependent Variables (Part I)

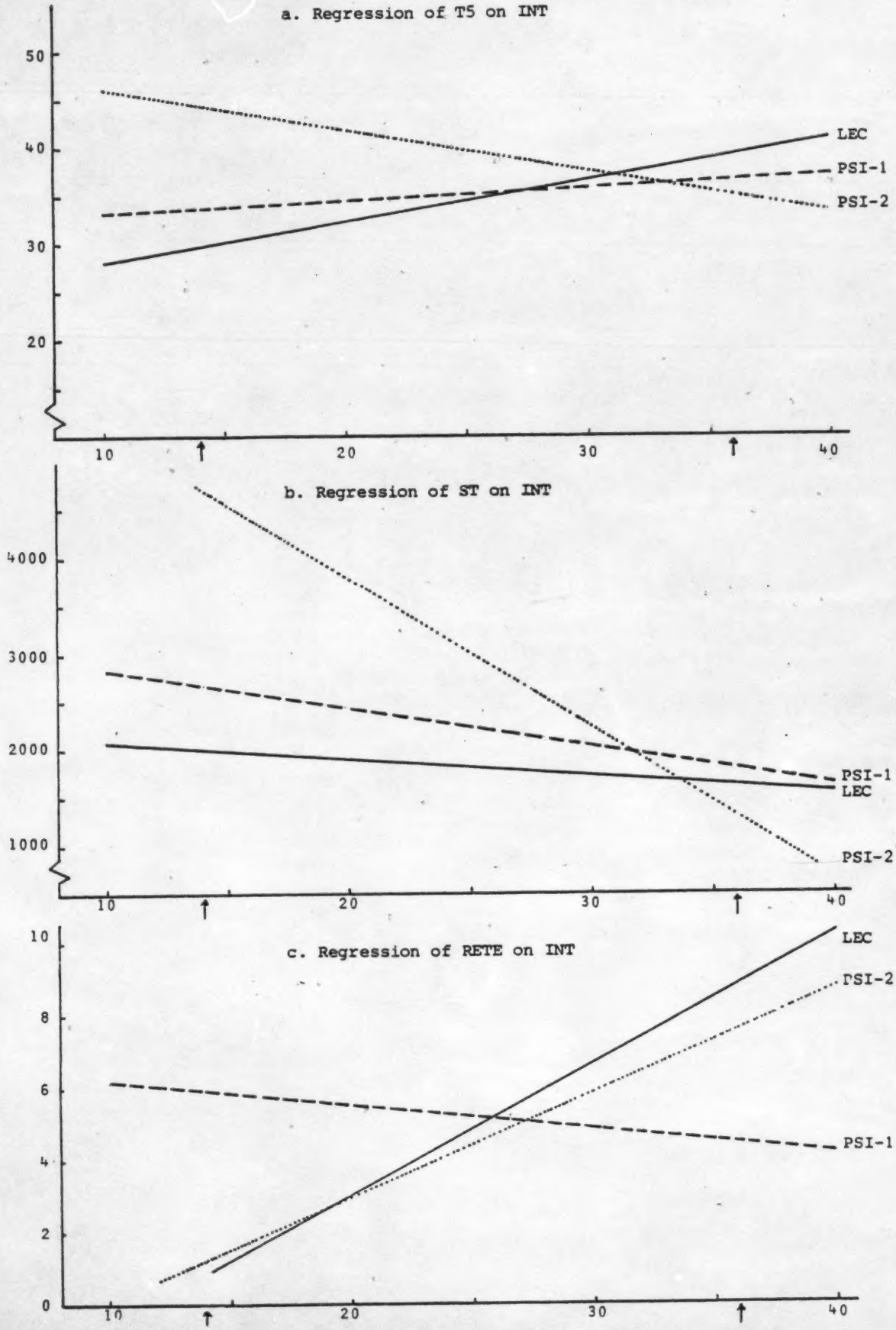
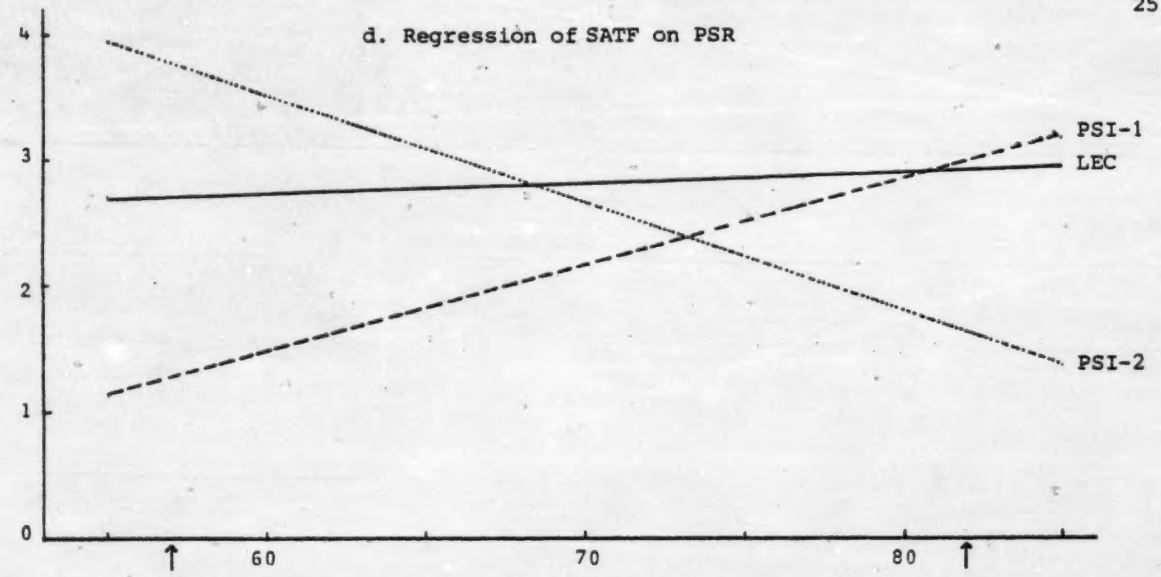
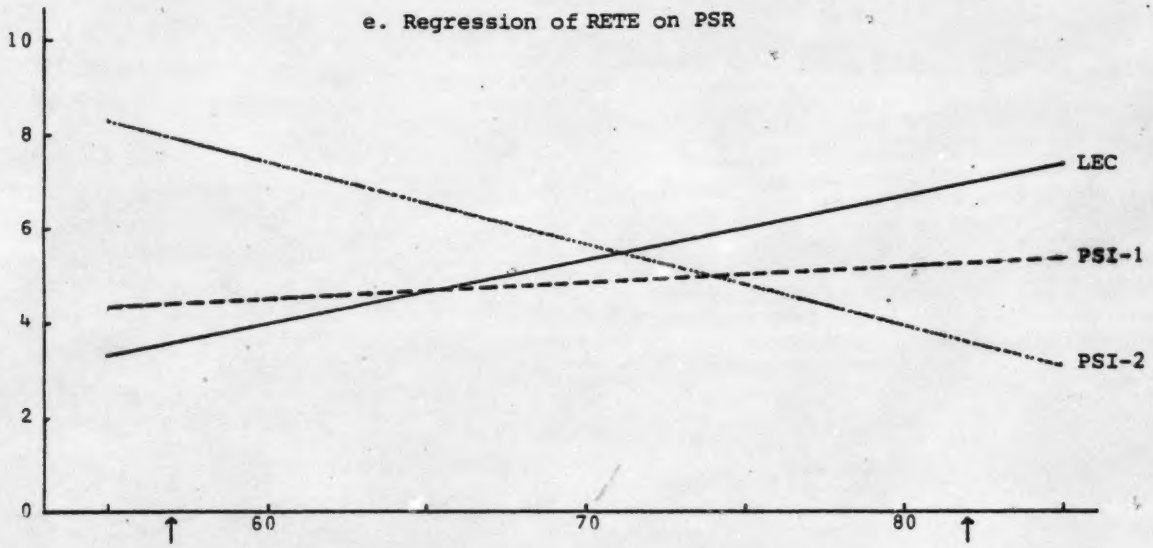


Figure 2 : Regression of Various Aptitudes on Various Dependent Variables (Part II)





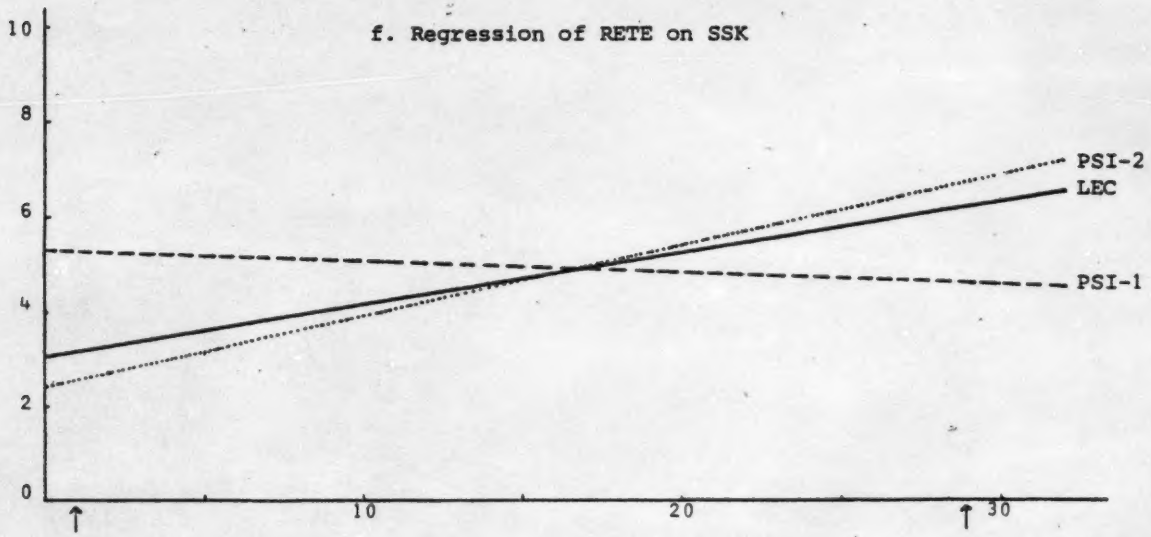
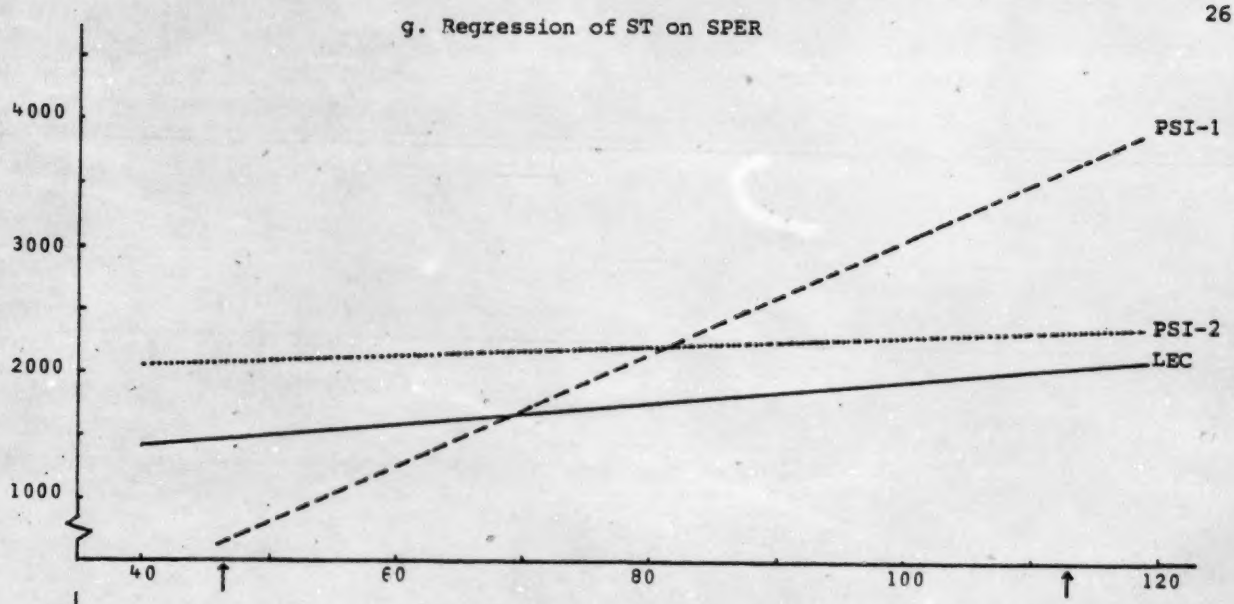
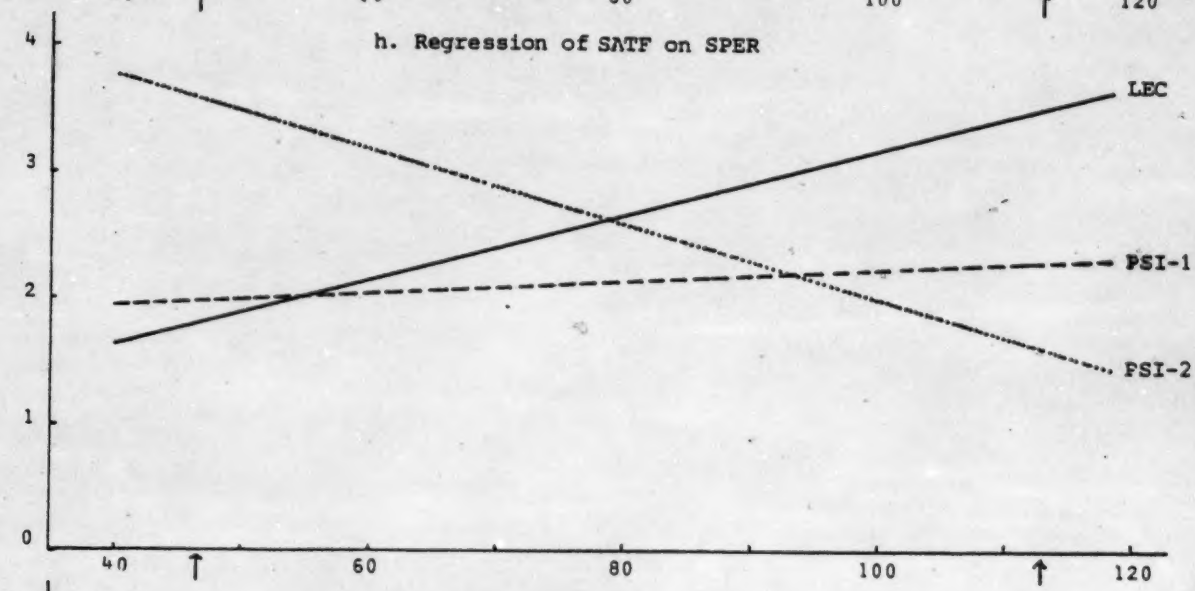


Figure 2 : Regression of Various Aptitudes on Various Dependent Variables (Part III)

g. Regression of ST on SPER



h. Regression of SATF on SPER



i. Regression of RETE on SPER

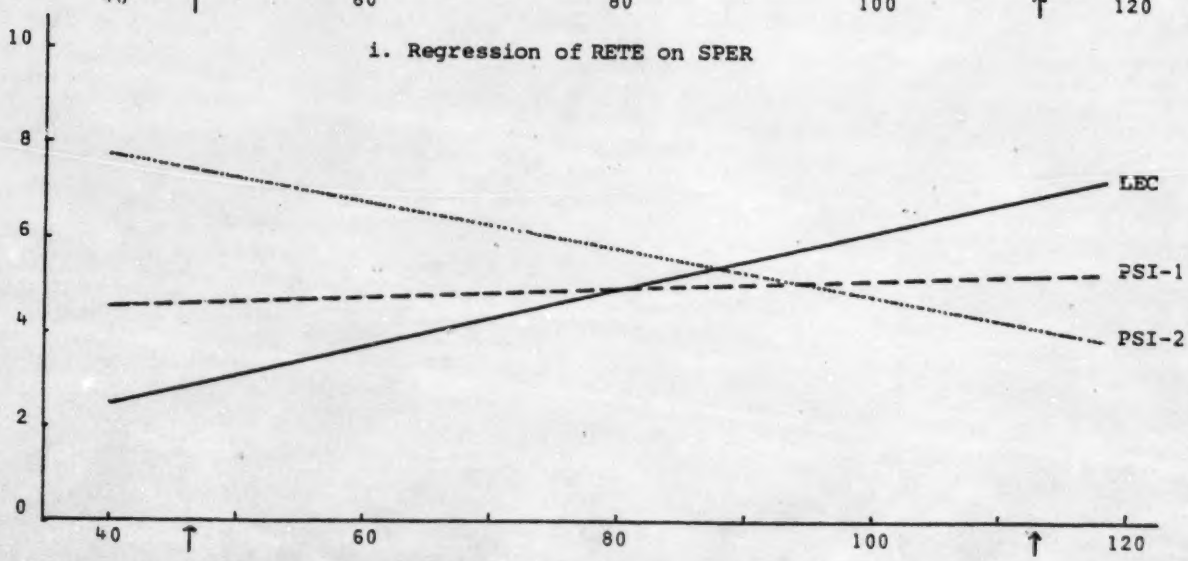
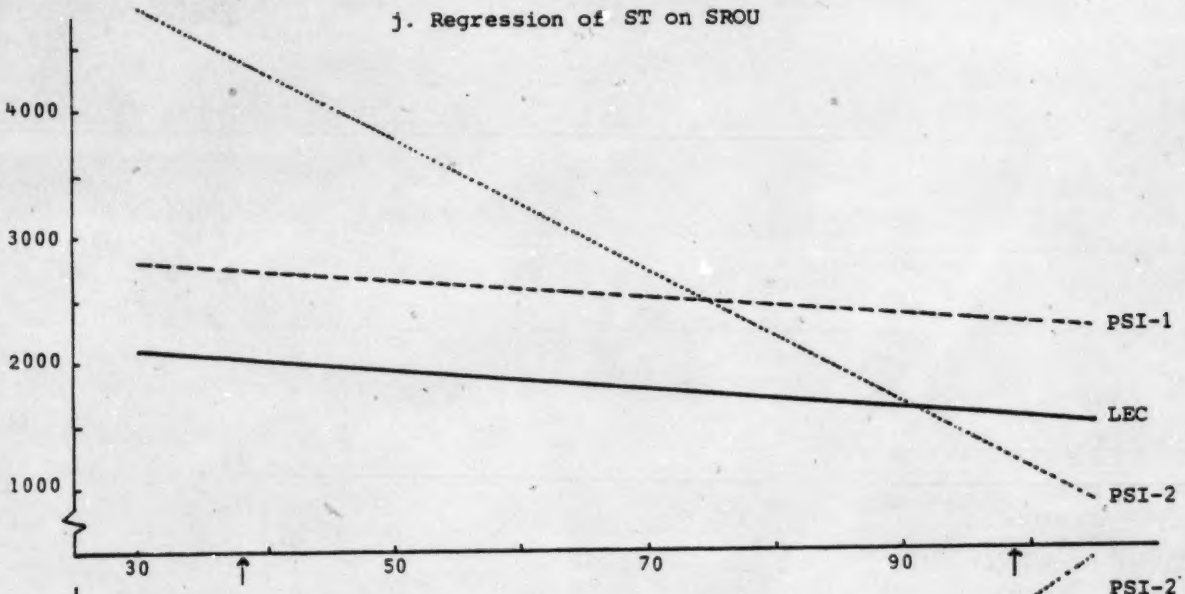
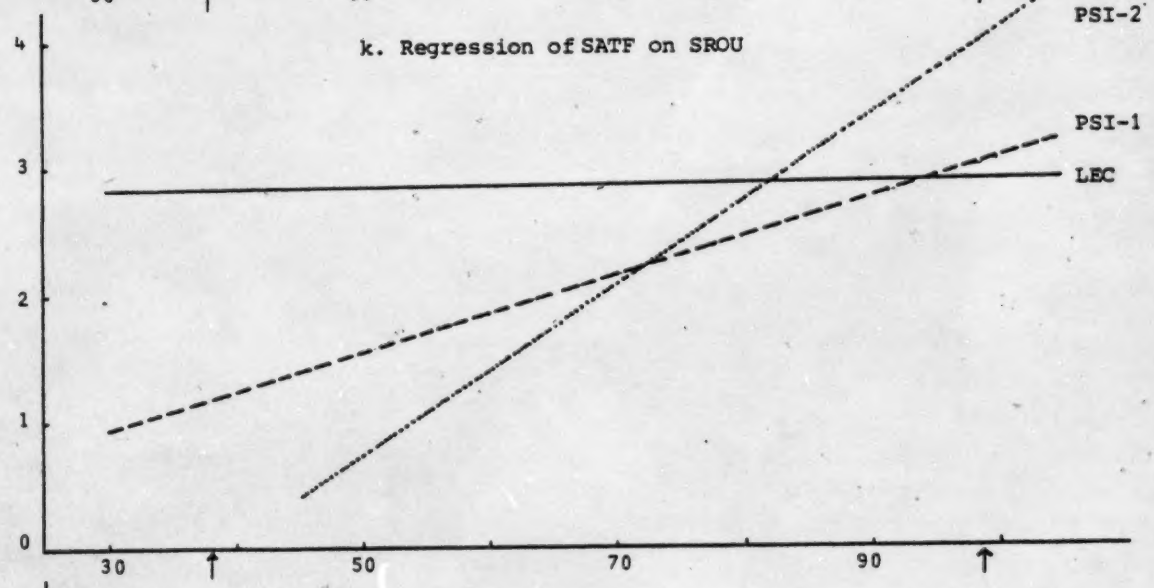


Figure 2 : Regression of Various Aptitudes on Various Dependent Variables (Part IV)





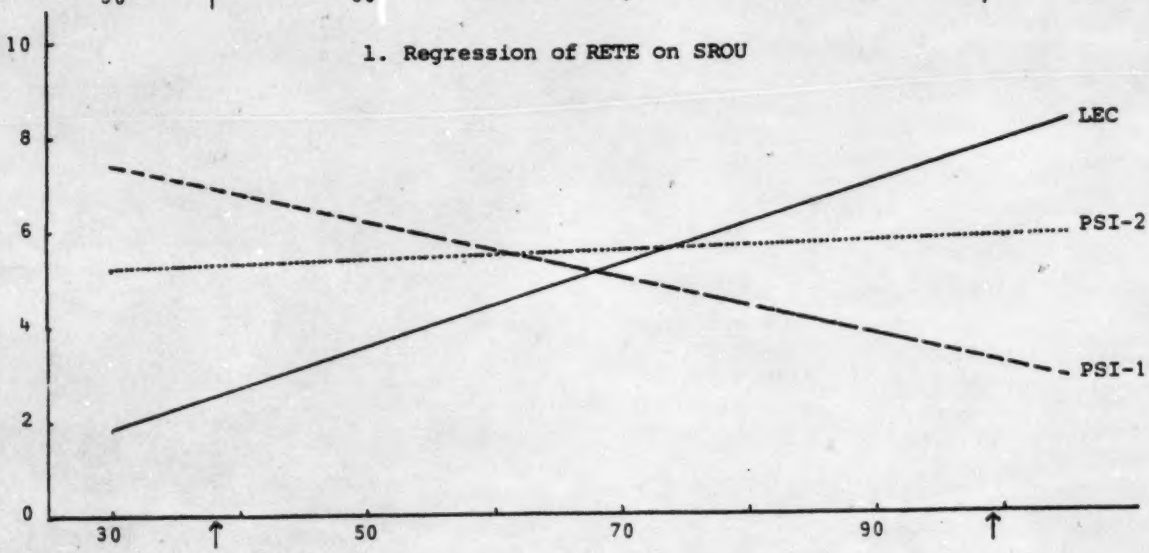


Figure 2 : Regression of Various Aptitudes on Various Dependent Variables (Part V)